Eastern Divide Insect and Disease Project Phase II

Dismal Creek Sediment Analysis

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Significant Issue

There is concern that the commercial harvesting, bladed skid trails, temporary and spec road construction and use/maintenance of existing roads may adversely impact water quality, stream habitat and aquatic biota, in a cumulative manner, within the Dismal Creek watershed and designated critical habitat (unit 2a) for Candy Darter.

Scope of the Analysis

A USFS sediment transport model was used to estimate the tons of sediment produced by each landing, skid road, temporary and spec road, and delivered to respective stream channels (USFS 2019). Soil erosion was calculated using (1) erosion rates derived from research data from North Carolina and West Virginia (Swift 1984; Kochenderfer and Helvey 1984) and (2) the Universal Soil Loss Equation, as adapted to forest land (Dissmeyer and Foster 1984). The Universal Soil Loss Equation includes site-specific factors related to soil type and land slope. Erosion is expressed as tons per acre moved from the site. This unit rate is multiplied by the disturbed area in acres to obtain unmitigated erosion in tons. This figure is then adjusted for factors of geology and soils, road gradient, and mitigation to obtain an adjusted value of total erosion. Total erosion is then delivered to the stream channels based on aggregated sediment delivery ratios from the procedural guide '*An Approach to Water Resources Evaluation of Non-Point Silvicultural Sources*' (WRENSS) (EPA 1980). The sediment delivery ratio for each segment of soil disturbance is calculated using factors based on side slope, soil texture, distance to the nearest channel, and factors of surface roughness, slope position, percent ground cover, and slope shape. These combined factors are translated into a Sediment Delivery Index that represents the portion of eroded material that is actually delivered to a stream. When multiplied by the calculated erosion, it gives an estimate of tons of sediment delivered to the adjacent stream channel. This sediment increase is compared with existing annual sediment yield from each watershed as determined by data from Whiting (2006) and displayed as a percent increase over existing background conditions.

Rates of soil erosion and sedimentation are greatest at the time of soil disturbing activity and decrease as the soil stabilizes and vegetation re-establishes over time. Sediment modeling is based on numerous assumptions that may not be accurately reflected on the ground. Thus, the model results provide rough approximations of the magnitude of change in sediment delivery that might be expected as a result of proposed management activities. Nevertheless, they allow a comparison of the impacts of the proposed action and provide a measure of relative risk to the aquatic ecosystem. The model assumes that Forest Plan standards and guidelines as well as Virginia Best Management Practices for Forestry will be implemented. It also assumes ‘normal’ runoff and sediment years. Table 1 displays the results of the sediment model for total sediment produced (tons/year) by the proposed action and percent increase to the modeled existing background condition.

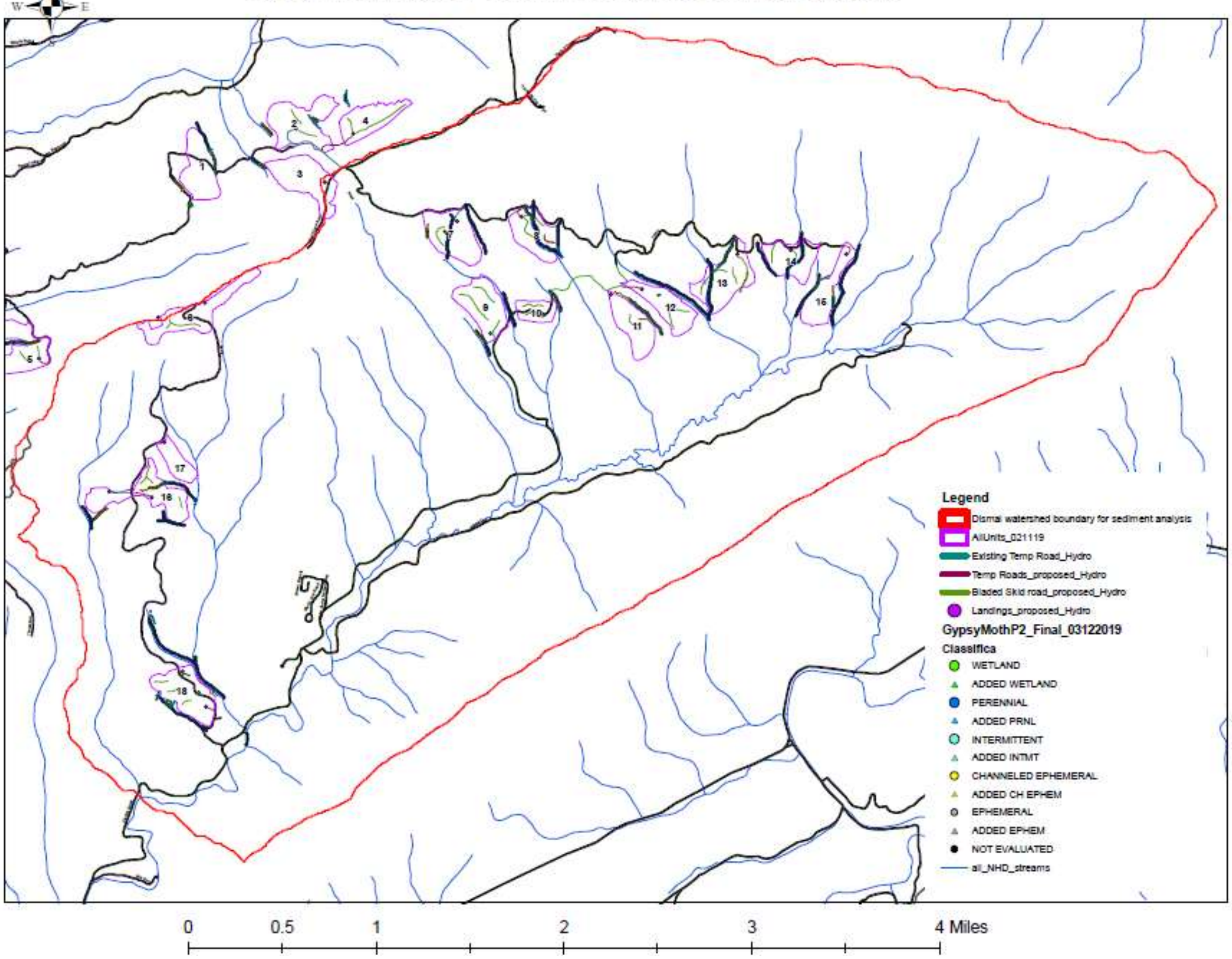
Table 1. Dismal Creek Model Results for Sediment Produced from Management Activities and increases to background sediment levels to Candy Darter Critical Habitat Unit 2a (USFS 2019).

	Total Sediment Produced (tons/year) from Proposed Management Activities	**Dismal Creek watershed -** Percent Increase to Background Sediment Load per year
Proposed Action	4.99	2.26%

The modeled sediment loads shown in Table 1 represents the total impact from all the proposed management activities, as if they occurred in one year. In reality, these actions may be spread over a longer time period, so it should be interpreted as the maximum predicted sediment load per year. As such, the sediment increase to Dismal Creek from the proposed action is 4.99 tons/year, which represents 2.26% increase above background conditions. It is assumed that after management activity has ceased across particular units, the area will start to recover quickly. Post surface disturbing activity, the subsequent year sediment rates are estimated to be 50 percent of first year rates (Luce and Black 2001). After four years, sediment rates have usually returned to pre-disturbance levels (Luce and Black 2001).

In conclusion, the sediment impacts to Candy Darter and designated Critical Habitat (Unit 2a) in Dismal Creek are difficult to accurately predict, given timing and intensity of sediment transport. However, native fish have adapted to sediment variability that naturally can range widely from year to year (interannual variability). There would be no expected long-term change in the streambed composition or in aquatic habitat quality or complexity from sediment transport related to the proposed action in the Dismal Creek watershed. The predicted sediment increases to Dismal Creek are expected to be insignificant and immeasurable, and within the natural range of variability of annual sediment loads to the streams. Thus, there would be no measurable or observable direct or indirect sedimentation effects to water quality or stream health under normal precipitation years.

Gypsy Moth Phase 2 - Dismal Watershed Sediment Analysis



Literature Cited

Dissmeyer, George E., and George R. Foster. 1984. A guide for prediction sheet and rill erosion on forest land. U.S.D.A. Forest Service Technical Publication, R8-TP 6.

Kochenderfer, J.N. and Helvey, J.D. 1984. "Soil losses from a 'minimum- standard' truck road constructed in the Appalachians." IN: Peters, P.A. and Luchok, J. eds. Proceedings, Mountain Logging Symposium. June 5-7, 1984. Morgantown, WV: West Virginia University. pp. 215-225.

Luce, C.H. and T.A. Black. 2001. Spatial and Temporal Patterns in Erosion from Forest Roads. *In* Influence of Urban and Forest Land Uses on the Hydrologic-Geomorphic Responses of Watersheds, Edited by M.S. Wigmosta and S.J. Burges. Water Resources Monographs, American Geophysical Union, Washington, D.C. pp. 165-178. http://www.fs.fed.us/rm/pubs_other/rmrs_2001_luce_c008.pdf

Swift, L. Jr. 1984. Soil losses from roadbeds and cut and fill slopes in the Southern Appalachian Mountains. So. J. Applied Forestry. Vol. 8 No. 4. pp. 209-215.

U.S. Environmental Protection Agency (EPA). 1980. An Approach to Water Resources Evaluation of Non-Point Silvicultural Sources (A Procedural Handbook). Washington, D.C., EPA/600/8-80/012 (NTIS PB81119828) https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryID=43403

U.S.D.A. Forest Service (USFS). 2019. Dismal Creek Sediment Transport Model for the Gypsy Moth Phase 2 Vegetation Management Project. Excel spreadsheets created by C. Lane and P. Adams. U.S.D.A Forest Service, George Washington & Jefferson National Forests. Roanoke, VA.

U.S. Geological Service (USGS). 2019. Stream Stats Reports Generated for the Dismal Creek Watershed. http://ssdev.cr.usgs.gov/streamstats/

Whiting, Peter J., 2006. Estimating TMDL Background Suspended Sediment Loading to Great Lakes Tributaries From Existing Data. Journal of the American Water Resources Association (JAWRA) 42(3):769-776.